

CHAPTER 14

TELEVISION

Television is the offspring of three media — the theater, film and radio. In a relatively short period (about 45 years), television has progressed from a mere novelty, to arguably, the most powerful information and entertainment medium.

The technological advancements of television in this short time frame are quite remarkable. Color television sets virtually replaced black-and-white models, cable television eliminated the need for viewers to tune in broadcast channels with “rabbit ear” antennas, and videotape, videotape machines and character generators (CGs) signaled the end of 16mm television film and cumbersome production equipment and methods.

The military services recognized the potential of this new form of communication and started Armed Forces Television at Limestone Air Force Base, Maine, in 1953. The success of this experimental station convinced DoD officials that overseas television stations were feasible. One year later, the DoD officially recognized the television mission and combined it with Armed Forces Radio to form the Armed Forces Radio and Television Service (AFRTS). In 1976, the CNO established the Navy Broadcasting Service (NBS) to manage AFRTS outlets within the DON.

Most likely, your initial television broadcasting experience will be with an NBS detachment overseas or aboard a ship equipped with a Shipboard Information, Training and Entertainment (SITE) system. For these reasons, you are responsible for knowing the basics of this fascinating but demanding medium.

HOW TELEVISION WORKS

LEARNING OBJECTIVE: Identify how the television medium works.

Television is the process of converting reflected light rays from a subject or scene into electrical impulses and reproducing these impulses at a distant receiver.

The television camera picks up reflections of light from the scene, while the microphone picks up sound. The camera changes the light reflections into electrical impulses, and at the same time, the microphone changes the sound into electrical impulses. These impulses are sent to the transmitter or are recorded on videotape.

To be viewed, the signal from the transmitter is received by the viewer’s television set, or the recording is played back — either to the transmitter or directly to a receiver. At the receiver, the picture and sound signals are isolated and sent through separate picture and sound circuits. Electronic components within your television set change these signals back to video on the cathode-ray picture tube and audio on the television speaker.

THE TELEVISION CAMERA

LEARNING OBJECTIVE: Recognize the basic operation, electronic characteristics and main types of television cameras.

The television camera is the heart of the television system. It records the varying amounts of light reflected from objects in the televised scene. This amount of light varies according to the lighting, color or shade of the object.

Figure 14-1 shows a banner with the word *NAVY* printed in black on a white background. The border

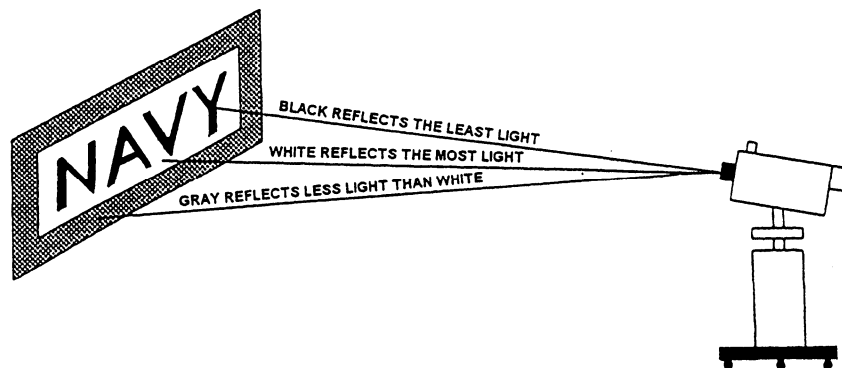


Figure 14-1.—The various amounts of light seen by the television camera.

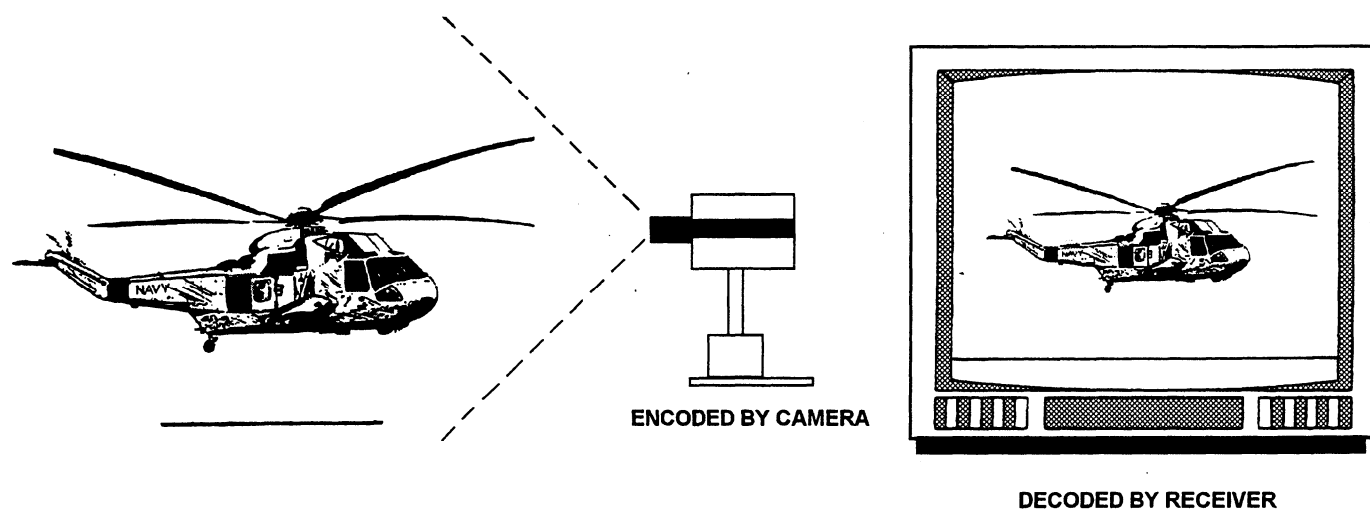


Figure 14-2.—The scanning process.

around the banner is gray. When light hits the banner, it reflects from the three different shades in different amounts. The white background reflects the most light, the gray reflects less, and the word *NAVY* reflects very little light. From this you can see that a scene made up of different shades or colors reflects different amounts of light. The television camera takes these various levels of light reflection and changes them into electrical impulses of varying strength.

A television camera is optically similar to a movie camera, except it does not use film. Instead, light reflections from the scene are focused by a lens and pass through the face of the photoelectric transducer (also called a pickup tube) of the camera. The pickup tube does the job of film in a camera. Its surface is coated with thousands of tiny globules of silver mixed with other chemical elements. This coating is photosensitive, which means it gives off electrons when exposed to light. Light from the scene covers the entire surface of the pickup tube and electrons are forced off its rear surface. The number of electrons forced off any part of the pickup tube is determined by the amount of light that strikes this part.

In figure 14-1, the Navy banner causes the pickup tube to give off electrons corresponding to the amount of light reflected from various parts of the banner.

At the present time, there is no practical method for transmitting a complete video picture instantaneously as a whole unit. Therefore, in television, the picture is broken into tiny units called elements, which are transmitted individually in sequence. The elements are so small that the human eye cannot distinguish one from

the other in the complete picture. The process of registering all the elements of a video picture in sequence is called scanning. During the scanning process, the television camera “encodes” the elements; then the television receiver is used to “decode” them in the proper order to recreate the original image (fig. 14-2).

ELECTRONIC CHARACTERISTICS

In this section, we examine the following electronic characteristics of a television camera:

- Operating light level
- Video noise

Operating Light Level

You need a certain amount of light in order for the pickup tube of the camera to perform its function. Although there are several ways to measure light, the footcandle is one of the more common units of measurement.

Whatever term is used, make sure your light-measuring device is in the same language as the manual for your camera. For example, if the manual calls for a minimum of 100 footcandles of light, you will need a light meter that reads in footcandles.

Some cameras have a way to give you more light when you need it. The dB gain switch (fig. 14-3), usually located on the back of the camera, has two positions — 6dB and 12dB. For every 6dB of gain, the camera output

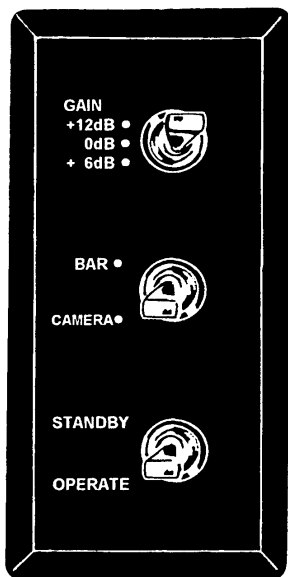


Figure 14-3.—Television camera dB gain switch.

signal doubles in amplitude to increase the video level effectively. That means the 6dB setting doubles signal strength and the 12dB setting is four times more than the 6dB gain.

Video Noise

Video noise increases in proportion to the video gain previously described. Even the best cameras will deliver “noisy” pictures under low-light levels. A noisy picture has a great amount of snow, or white vibrating spots, in the picture. This occurs when the video signals produced by the pickup tube are not strong enough to override the electronic interference the system usually generates. At 12dB gain, the system is generating more electronic interference — and more video noise.

Having covered the basic operation and electronic characteristics of a video camera, we now examine the types of video cameras you will work with at NBS detachments.

STUDIO CAMERA

The studio camera (fig. 14-4) is the backbone of the television industry. It is mounted on a dolly pedestal so the camera operator may wheel it to different locations with relative ease during shot changes.

Television technicians monitor and adjust the video levels of the studio camera with the camera control unit

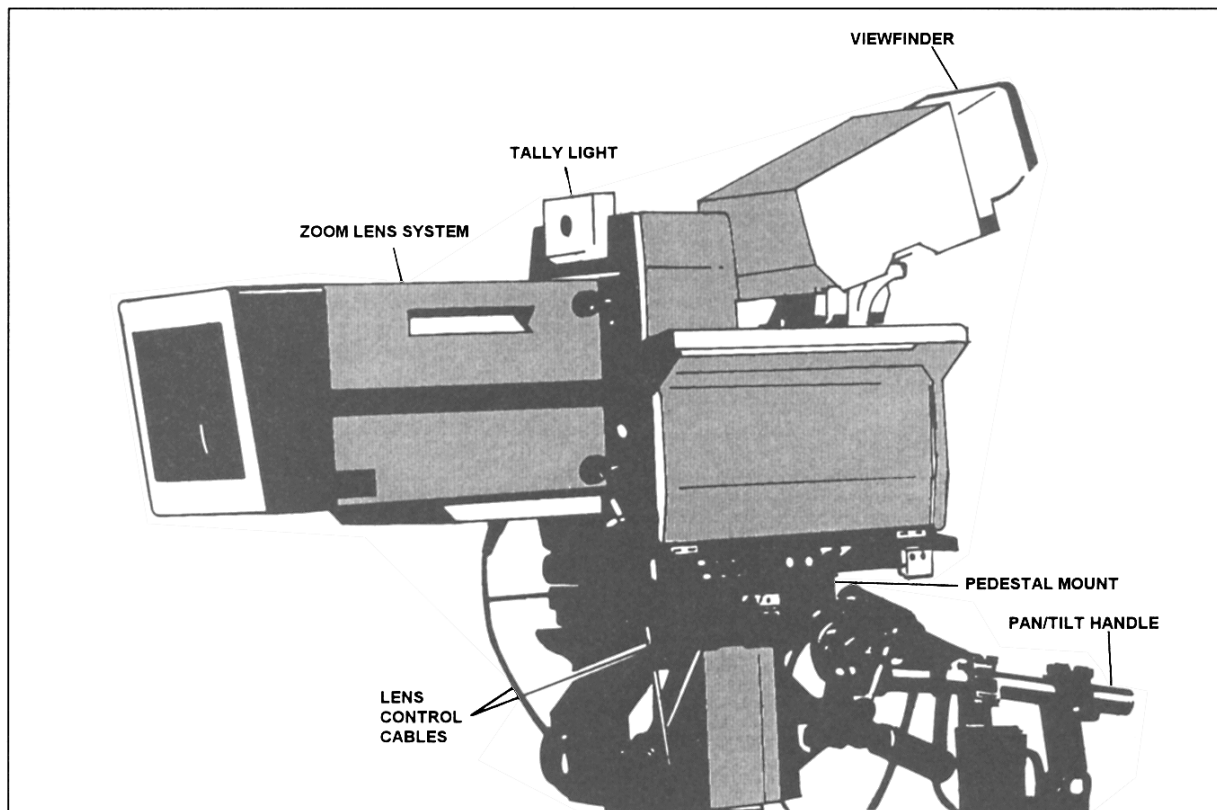


Figure 14-4.—Studio camera.

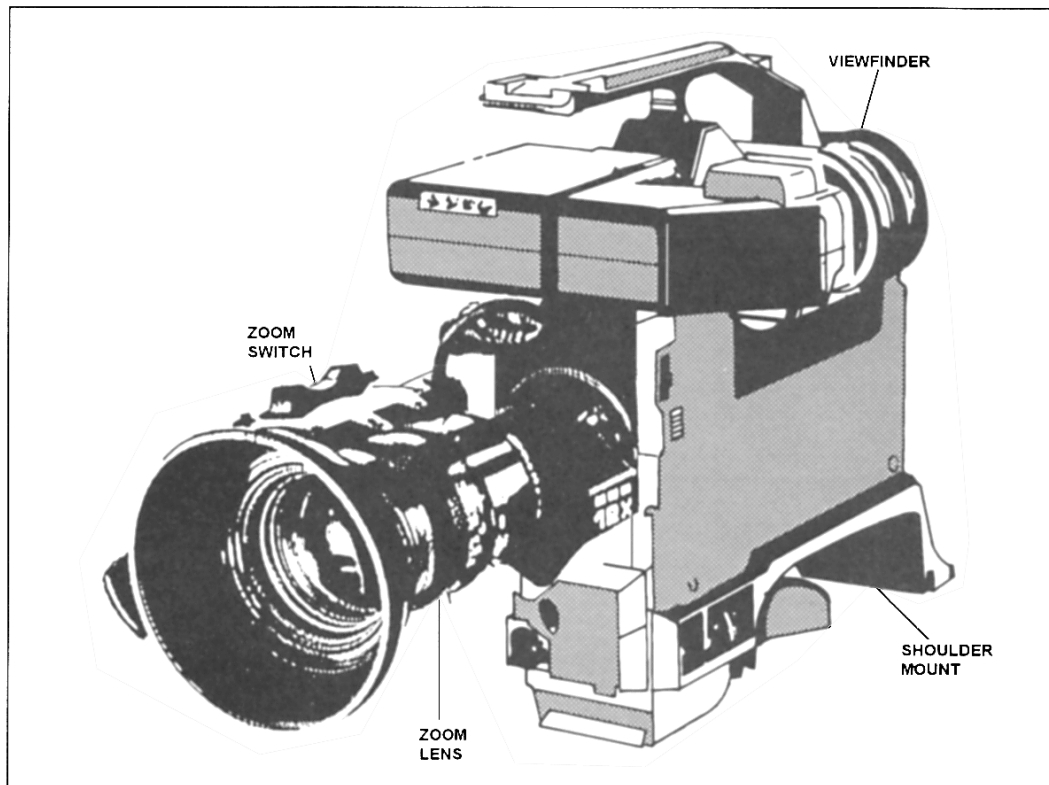


Figure 14-5.—Electronic news gathering (ENG) camera.

(CCU), usually located in the control room. The CCU consists of a waveform monitor (an oscilloscope that displays a video signal graphically), television monitor and shading control.

Studio cameras are expensive, ranging in price from under \$5,000 to more than \$100,000. However, the more expensive cameras deliver high-quality images in a variety of production conditions.

ENG CAMERA

The electronic news gathering (ENG) video camera replaced 16mm motion-picture film for television news in the mid-1970s. The ENG cameras are automated and fully operational within a few seconds after they are switched on. You can make adjustments to extreme production situations quickly and easily.

Most ENG cameras weigh between six and 20 pounds, depending on the number of pickup tubes inside the camera. They are powered by batteries, but you may also run them from AC current using an adapter. An ENG camera is shown in figure 14-5.

CONVERTIBLE CAMERA

Some of the more expensive ENG cameras maybe converted from an ENG format to a studio camera head with a large viewfinder and advanced zoom lens. In terms of practicality, the convertible camera is tough to beat because you can use the same camera for two distinct applications. For instance, you can use a convertible camera to cover the 11 a.m. ribbon-cutting ceremony at the new Navy Commissary, then connect it to a CCU in the control room for the evening news six hours later. Furthermore, the convertible camera is invaluable for remote productions requiring several cameras, such as sporting and entertainment events. A convertible camera is shown in figure 14-6.

CAMCORDER

Unlike the standard ENG camera, which must be connected to the videocassette recorder (VCR) with a cable, the camcorder (fig. 14-7) combines a camera and a videocassette in one unit. The camcorder weighs less than an ENG camera and may be operated by one person. This allows increased mobility in tight ENG situations.

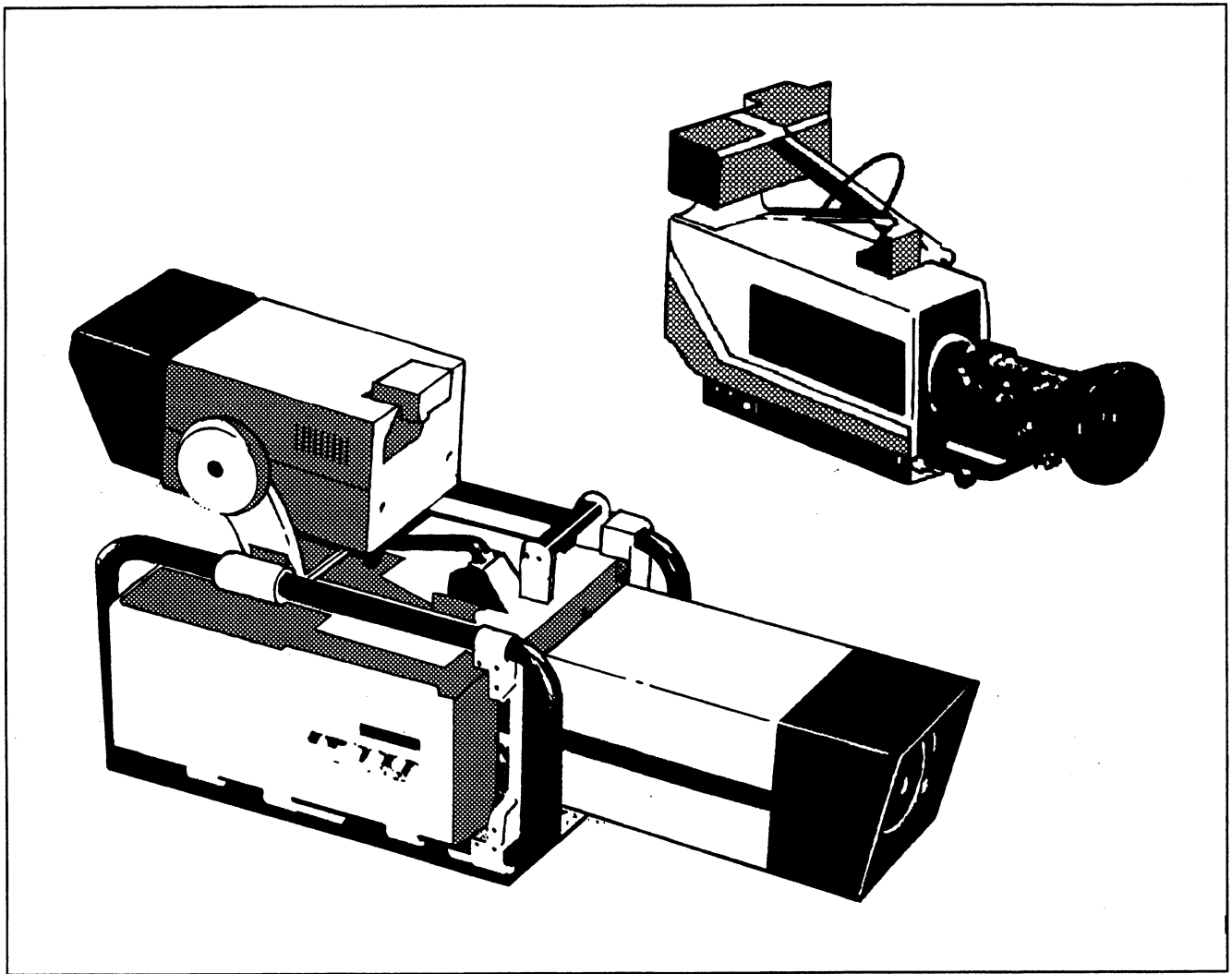


Figure 14-6.—Convertible camera.

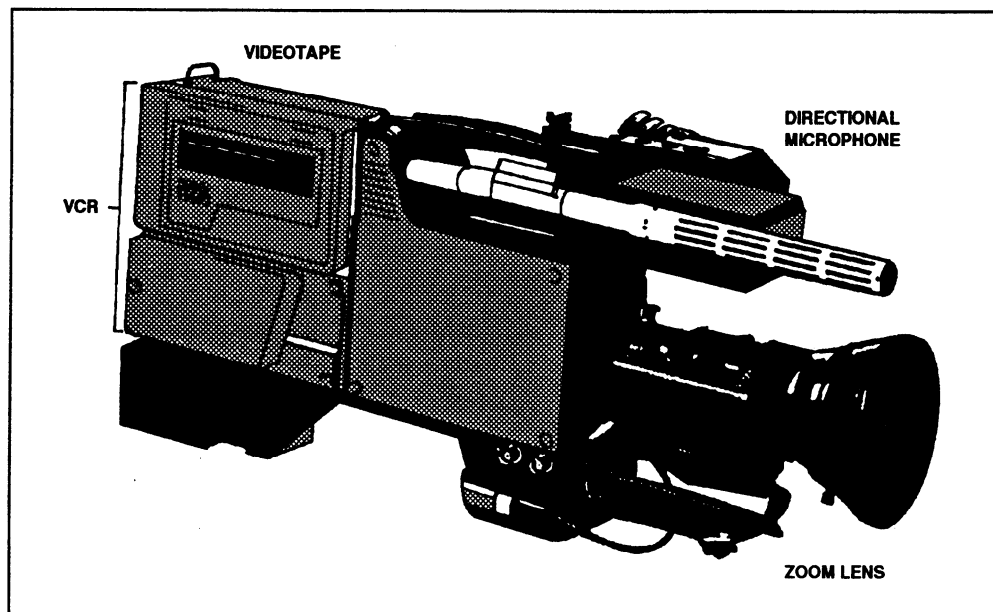


Figure 14-7.—Camcorder.

TELEVISION CAMERA OPTICS

LEARNING OBJECTIVE: Identify the optics of a television camera.

You were introduced to the functions of camera lenses in Chapter 11. The lenses and the associated optics for television cameras (save viewfinder) operate in the same manner as still photography, but we will cover them briefly as they apply to the television medium.

VIEWFINDER

The viewfinder on an ENG camera is a relatively small television screen (1.5 inches in diameter), while a studio camera viewfinder is larger (3 to 9 inches in diameter). They both produce high resolution black-and-white images. The television screen on an ENG camera is shielded from outside reflections by a flexible rubber eyepiece that adjusts to the operator's eye. In that rubber eyepiece, there is an adjustable lens for you to focus since the eye is placed within an inch or two of the screen. The studio viewfinder uses a hood to shade the television screen from overhead studio lights.

Within the ENG camera viewfinder, there are a number of control lights or displays that indicate the status of certain camera functions. Most viewfinders automatically display information on tape status, battery condition, tally/record light and low-light level indicator. The viewfinders display, on command, color bars, patterns, white/black balance setup cursor and camera registration. All camera viewfinders are black-and-white.

In some camera models you may use the viewfinder as a playback monitor for the VCR. The advantage of this feature is that you do not need additional equipment to set up the camera. However, some video camera manufacturers are discontinuing this feature because today's cameras are more reliable and recorders have indicators to let you know when you are recording.

LENS

The lens selects a certain field of view and produces a small, clear optical image of this view. The lens and certain attachments are sometimes called the external optical system.

When you work with video camera lenses, you concern yourself with the following four areas:

- Focal length
- Focus
- f/stop

- Depth of field

Focal Length

As you learned in Chapter 11, focal length is the distance from the optical center of the lens (which is not always its physical center) to the point where the image, as seen by the lens, is in focus.

Portable television cameras have a zoom, or variable focal-length lens (fig. 14-8), that allows you to select fields of view at different distances from the camera without moving the camera. It allows you to change the focal length of the lens from long to short or from short to long in one continuous operation. A complicated series of lenses interact to keep the object in focus at all times during the zooming process. "Zooming in" is the gradual changing of the lens from a wide-angle lens to a narrow-angle lens. On the television screen, a zoom in appears as though the camera is moving smoothly toward the object. "Zooming out" is the changing of the lens from a close-up to a distant shot and it will appear that the camera is moving away.

The degree to which you can change the focal length of a zoom lens is the zoom range of your lens. The range is often given in a ratio, such as a 10:1 zoom range. This means you can increase your focal length 10 times. Some cameras have a "times two function," which allows you to double the focal length at any point in the zoom, thus making the maximum 20:1 for the above example.

You can control the speed of your zoom either manually or by using a zoom servo. These features are covered in the following text.

MANUAL ZOOM CONTROL.— The manual zoom control on ENG cameras is a small rod extending from the zoom ring. To zoom in or out, turn the zoom rod clockwise or counterclockwise. It takes some skill and practice to accomplish smooth zooms with the manual control.

ZOOM SERVO.— A zoom servo is nothing more than a small motor controlled by a lever. The distance the lever is depressed determines the speed of the zoom — typically from 2.5 to 20 seconds. The lever is called the zoom selection or T/W switch — T stands for telephoto and W for wide angle.

There are several advantages to the zoom servo system. Zooms are steady and smooth, especially during slow zooms. The zoom control is easy to operate and allows you to concentrate more on picture composition and focusing. The zoom servo also frees the left hand to operate the manual focus and aperture controls.

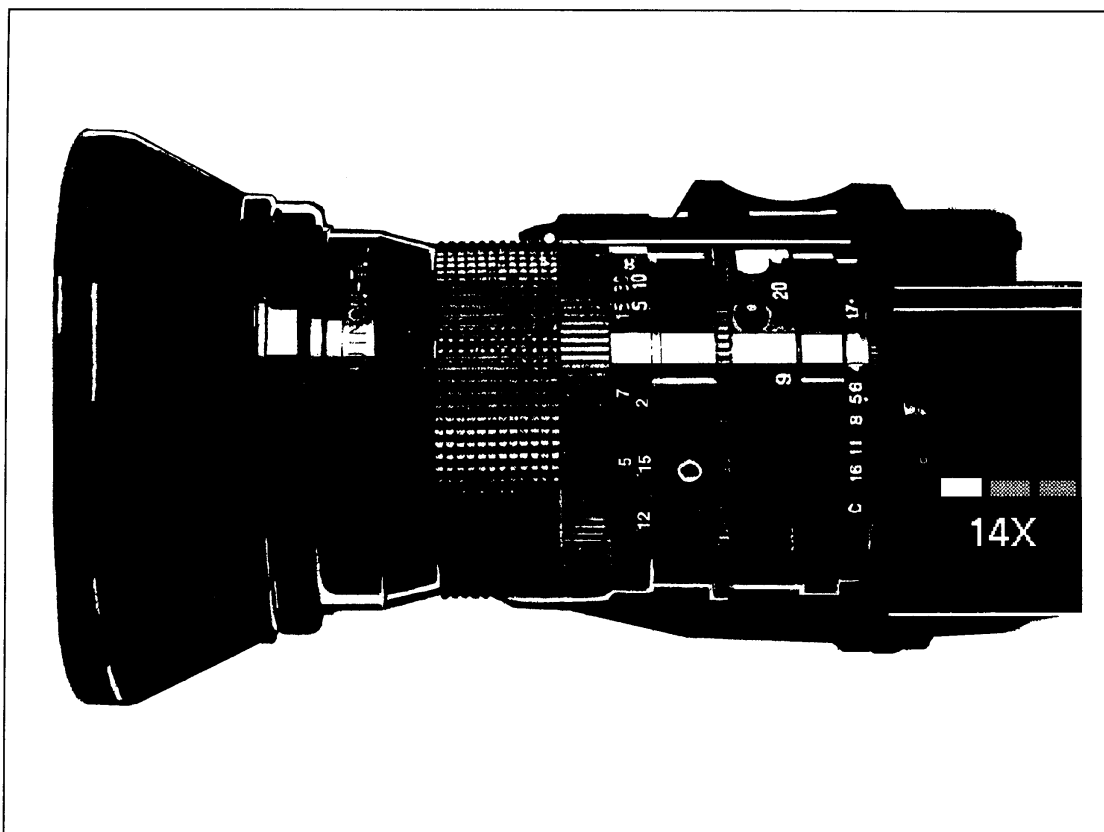


Figure 14-8.—Zoom lens.

You must be aware of two disadvantages of the zoom servo. Although relatively quiet, some zoom servo motors emit a humming noise that is picked up by the camera-mounted microphone. Additionally, the motor uses power provided by the camera battery.

FOCUS CONTROL.— The focus control is usually a rubber-covered ring on the zoom lens. To operate it, you rotate the focus ring either clockwise or counterclockwise while looking in the viewfinder to determine if the picture is in focus.

Focus

Two methods of setting the focus on a zoom lens are used. One, called **zoom focus**, is done by zooming all the way in and setting the focus, then zooming out to the desired focal length. Once this is done, everything in the depth of field will remain in focus, including the object focused on, provided the distance between it and the camera does not change.

Another focusing method is called **rack focus**. This is nothing more than your setting the focus on something in the field of view. When you do this, only that object and other objects at the same distance will remain in

focus as long as the distance between them and the camera does not change.

You should rack focus when there is not enough time to zoom focus. However, there are times when the effects of a rack focus are desirable, such as when the viewer's attention is directed toward something in the foreground and you want to lead him to another object. You can do this by changing the focus to bring the other object into sharp focus while the first object goes out of focus.

f/Stop

As noted earlier, the camera pickup tube will operate properly only within a certain range of light intensity. If too much or too little light falls on the pickup tube, the picture quality will suffer.

Since you will use the camera both indoors and outdoors, you must compensate for extreme differences in light levels. The lens diaphragm, or iris, is used to control the amount of light that enters the lens and the camera by enlarging or reducing the aperture. The f/stops indicate the size of the lens (diaphragm) opening.

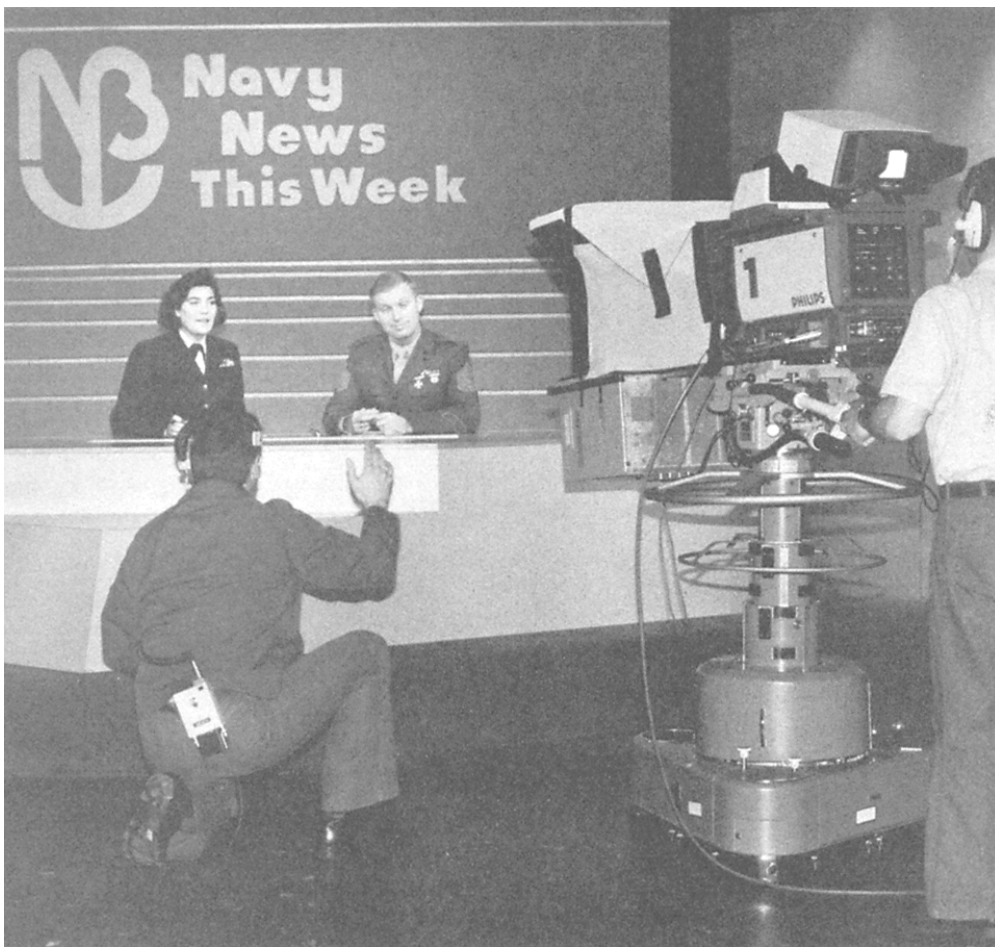


Figure 14-9.—The talent, camera operator and floor manager on the set of Navy News This Week (now titled Navy/Marine Corps News).

The lower the f/stop number, the wider the lens opening. When you zoom in, the lens will require more light, a wider opening and a lower f/stop number.

Most television cameras have an automatic iris that allows you to devote your attention to other important aspects of videography, such as framing and composition. Although the automatic iris seems ideal for ENG assignments, it does not always work to your advantage. With fairly even illumination, the auto iris closes down when it sees an extremely bright area in a scene or opens up when it senses a large, dark area. You can avoid this by switching to the manual iris control.

Depth of Field

It is important for you to know that f/stops do more than just determine the amount of light entering the camera. They also affect the depth of field.

As in still photography, a large diaphragm opening (small f/stop number) decreases the depth of field, and a small diaphragm opening (large f/stop number) increases it. The same rules apply when you move the camera. A great depth of field makes it easy for you to keep the subject in focus while moving short distances, whereas a shallow depth of field makes it impossible for you to move without getting the subject out of focus.

THE TELEVISION STUDIO PRODUCTION TEAM

LEARNING OBJECTIVE: Recognize the members of a television studio production team.

A television production, such as the one shown in figure 14-9, relies on the expertise of several individuals who do a myriad of jobs. These jobs are interdependent and must be coordinated to perfection.

As a member of a television studio production team, you will be called upon to function in any one of the following positions:

- Talent
- Camera operator
- Floor manager
- Audio switcher
- Video switcher

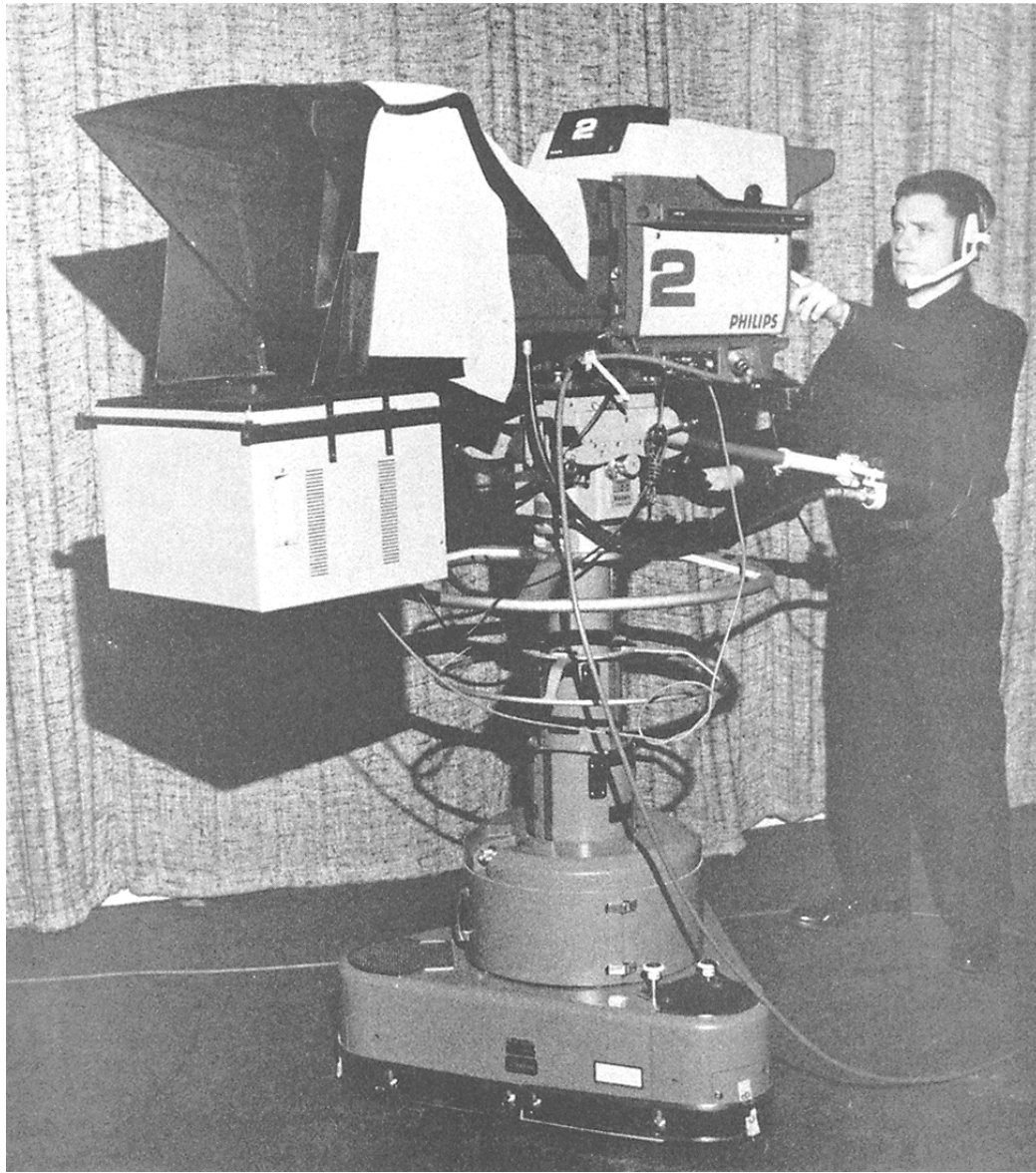


Figure 14-10.—Camera operator with headset.

- Director

TALENT

The television studio production centers around a performer of some sort, whether it be the CO explaining a change in base policy on captain's call or a colleague delivering the evening news. In television parlance, the performer is known as the talent. An array of support people assists the talent, including those who handle copy, wardrobe and makeup. The talent receives instructions from the director through the floor manager.

CAMERA OPERATOR

The images that appear on the television set are first determined by how and what the camera sees. Images from several cameras may be available for the director

and video switcher to use or blend to produce the transmitted picture. Unlike recorded videotape, the editing of a live studio production is accomplished as the picture is transmitted. Thus the television camera is the most important single television production element. All other elements and techniques are geared to the physical and electronic characteristics of the camera. Lighting, scenery, audio, writing and directing all depend, more or less, on the potential of the camera.

In most television studio productions, there are several cameras operating at the same time. As a camera operator, it is your responsibility to make sure you can operate your camera efficiently. You can only be efficient when you are completely familiar with your camera and use practical television camera-operating techniques.

During a production, you wear a headset that gives you direct communication with the director (fig. 14-10).

The director tells you when your shot is about to be used and when it is being used live. Even when your shot is not live, you should attempt to keep a shot that the director may find useful to the program. This will allow him to use that shot for coverage if something goes wrong with another shot or camera.

You may receive instructions from the director to move the camera, either to a new angle or to a new position on the studio floor. It is essential to a successful television production that all camera movements be carried out correctly, quickly, quietly and smoothly. The director relies heavily on the conduct of the television camera operators, and his job is easier when you respond to his commands not only quickly but accurately. This is particularly important during unscripted programs. (Television shooting techniques, including specific camera movements, are covered later in this chapter.)

FLOOR MANAGER

The floor manager stays in the television studio during a production. Through a headset system, he is in direct, two-way communication with the director in the control room. Normally, the talent is not able to use a headset and cannot receive instructions directly from the director. It is the prime responsibility of the floor manager to act as a liaison between the talent and the director.

Since it is not practical for him to instruct the talent orally during a production, the floor manager stands or kneels next to the camera that the talent should speak to and uses a system of hand signals to relay the director's instructions. Although any hand signal system understood by both the floor manager and the talent will work, we recommend you use the universally accepted system shown in figure 14-11.

The basic hand signals that both the floor manager and talent must understand are listed in the following text.

- **Stand by.** For the hand signal to “stand by,” the floor manager raises his hand and arm at the beginning of the show or following a spot break
- **Cue.** For the hand signal to “start talking” or “begin action,” the floor manager raises his hand and points to the talent.
- **Cut.** For the hand signal to “cease talking” or “stop action,” the floor manager draws his hand across his throat in a slashing motion.

- **Stretch.** For the hand signal to “stretch it” or “slow down,” the floor manager pulls his hands apart as if stretching a rubber band. Longer amounts of time are indicated when the floor manager places his hands farther apart at the end of the stretching motion; shorter time amounts are indicated when the floor manager places his hands closer together.
- **Speed up.** For the hand signal to “talk faster,” the floor manager rotates his arm and hand clockwise in a circle above his head. The speed of the rotations are related to the urgency of time.
- **OK.** For the hand signal that “everything is fine,” the floor manager makes a circle with his thumb and forefinger.
- **30 seconds to go.** For the hand signal that there are 30 seconds remaining in the show/segment, the floor manager forms the letter *T* with both hands.
- **15 seconds to go/wrap it up.** For the hand signal that there are 15 seconds remaining in the show/segment and the talent should wrap up what he is doing, the floor manager creates a grabbing motion with his hand that results in a fist.
- **Speak more softly.** For the hand signal to “speak more softly,” the floor manager raises the palm of his hand to his mouth.
- **Speak up.** For the hand signal to “speak up,” the floor manager cups his ear with his hand.
- **Speak or look at this camera.** For the hand signal to “speak or look at this camera,” the floor manager points to the on-air camera with his hand. A waving motion from one camera to another alerts the talent that the director is switching the shot to another on-air camera.

Be precise and deliberate when you deliver hand signals. Do not wave your arms in the air frantically — this will only confuse and imitate the talent.

During a television production, the studio floor is usually a maze of lighting and camera cables that can hinder the movement of the cameras and also be a safety hazard. The floor manager must make sure these cables are stored or positioned safely. Furthermore, he should find out from the camera operator and director how much camera movement is expected.

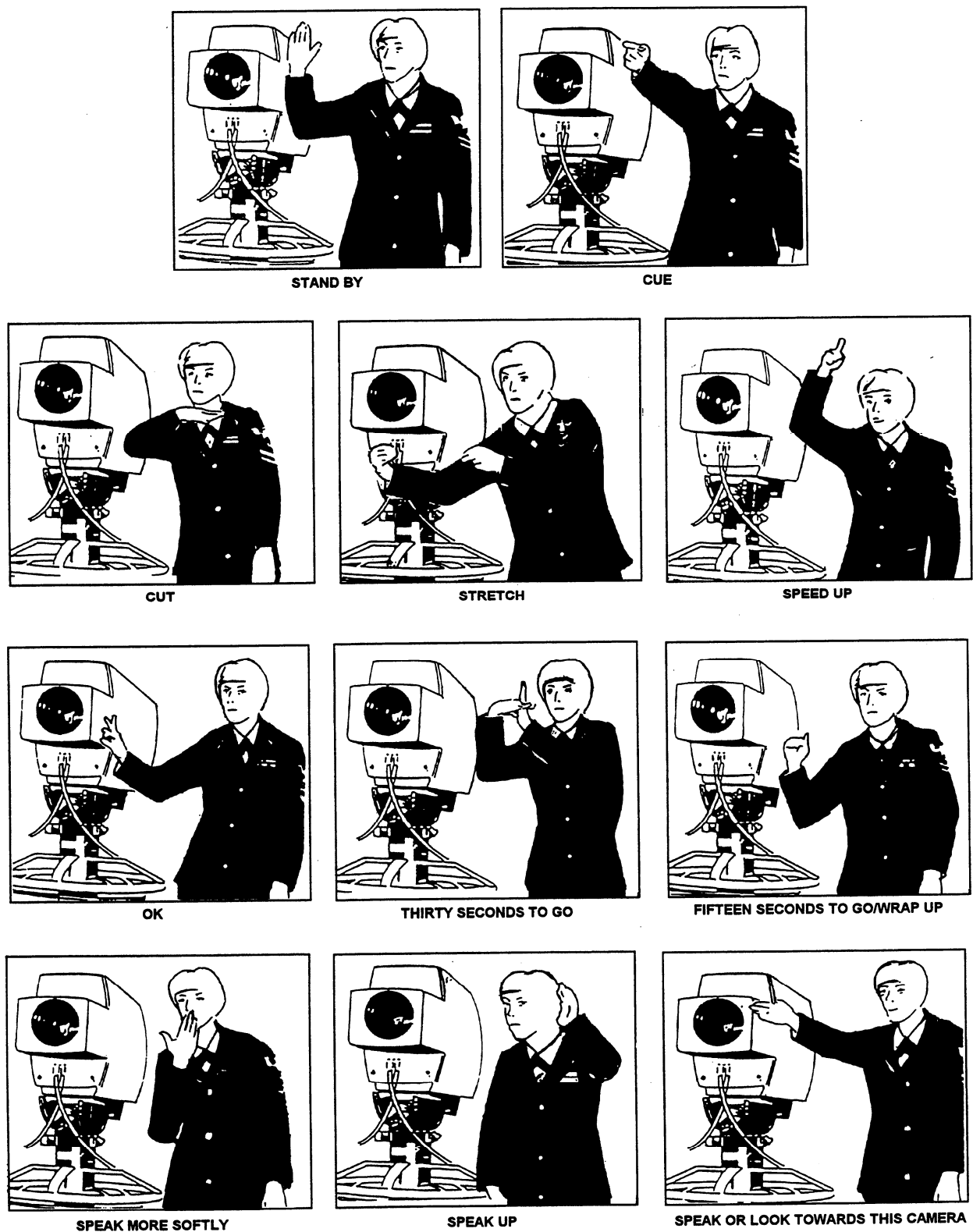


Figure 14-11.—Floor manager's hand signals.

Once a production is under way, any number of problems may develop on the studio floor. Cameras may refuse to move or the talent may develop giggling fits. In normal circumstances, the only way the director can find out about these problems is through the floor manager. Therefore, another responsibility of the floor manager is to keep the director informed of any developing situations on the studio floor that may affect the program.

AUDIO SWITCHER

The audio switcher is responsible for the smooth operation of the television audio mixing console. He must be able to respond quickly and correctly to the commands of the director.

The television audio mixing console is usually located in a separate booth, remote from the television control room. The audio switcher stays in the booth from the time immediately before the production — when he makes the necessary sound level checks — to that of the completion of the program. The console itself has all the sound inputs fed into it, including microphones from the studio floor, cart machines, CD players, and so forth. The audio switcher has absolute control over these inputs and must balance them so that they are at a compatible level.

Once all of the inputs are balanced, they maybe fed from the console to a receiver. The output must be at a level that is acceptable to the receiver (videotape recorder, television set or monitor) and must fade-in or fade-out at the command of the director. With practice, you will be able to mix and control sound smoothly and correctly.

VIDEO SWITCHER

Although the camera operator frames the shot and the director calls for it, the video switcher (fig. 14-12) is ultimately accountable for the picture that is recorded or broadcast. The video switcher is responsible for the smooth operation of the video-mixing console and the special effects bank. He directly controls what the audience sees. A mistake on his part cannot be covered up by the director.

The video switcher sits at the video-mixing console throughout the production and is completely responsible for its smooth operation. He must be able to operate the console efficiently and respond quickly and correctly to the commands of the director. The video switcher can only achieve such efficiency by having a thorough knowledge of the console equipment and by constantly

practicing mixing techniques. In addition, the video switcher must know how to apply the various special effects available to him and operate them smoothly.

DIRECTOR

The television studio production crew is a team, with everyone in the team working together toward one common goal — the successful airing of a production. Although each member of the team is responsible for the correct and efficient operation of his particular task, there has to be someone in charge — someone with an overall view of the situation and the way the various tasks are accomplished. This person is the director.

The director is totally responsible for the production. He is able to give instructions to every member of the crew, either directly, or in the case of the talent, indirectly. These instructions must be clear and concise — garbled instructions are worse than no instructions at all.

In a scripted production, only the talent *needs* a script, but it is the director's responsibility to be completely familiar with it so he may devote more of his attention to the actual production and less time wondering what the talent is going to do next.

It is also the director's responsibility to be aware of the functions of each member of his crew and their equipment. There is probably nothing worse and more frustrating for a production crew than to work with a director who sets impossible tasks for his crew because he is unaware of the functions and limitations of his people and their equipment.

During a studio production, the director gives commands to the camera operators and the audio and video switchers. These commands are covered in the following text.

Camera Commands

The director issues commands to the camera operators more than any other production team member to accomplish the following tasks:

- Setup shots
- Refine the framing and composition of a shot
- Direct the movement of a camera while the shot is on the air

When you serve as a director, you should remember the following guidelines: